

IN THE CLAIMS

Please find below a listing of all of the pending claims. The status of each claim is set forth in parentheses. This listing will replace all prior versions, and listings, of claims in the present application.

1. (Currently Amended) A method of detecting a degradation of quality of service in a multicast tree in an application layer multicast network, the method comprising:

detecting at a child node in the multicast tree a degradation of quality of service associated with a service being received at the child node;

determining whether the degradation of quality of service is resulting from a child-parent link or an upstream link to the child-parent link in the multicast tree, wherein the determining includes

transmitting a complaint to a parent node of the child node, the complaint indicating a degradation of quality of service at the child node,

if the parent node does not perceive the degradation of quality of service, a request is sent to a global information table for candidate parent nodes for the child node, and the request includes location information for the child node,

if the parent node perceives the degradation of quality of service, the parent node sends a complaint to the parent node's parent node to determine if the parent node's parent node also perceives the degradation of quality of service, and the complaint includes location information for the parent node;

selecting a new parent node for the child node from the candidate parent nodes in response to detecting the degradation of quality of service is resulting from the child-parent link; and

selecting a new parent node for a child node incident to the upstream link in response to detecting the degradation of quality of service is resulting from the upstream link.

2-3 Canceled.

4. (Currently Amended) The method of claim 1, further comprising:

~~transmitting a complaint to the parent node, the complaint indicating a degradation of quality of service at the child node;~~

receiving a list of ~~a set of~~ the candidate ~~parent~~ nodes in response to sending the request to the global information table and the degradation of quality of service resulting from the child-parent link; and

the selecting a new parent node includes selecting one of the candidate parent nodes from the list as [[a]] the new parent node for the child node.

5. (Currently Amended) The method of claim 4, further comprising constructing a new service path in the multicast tree including the child node and the new parent node.

6. (Original) The method of claim 5, wherein constructing a new service path further comprises:

establishing a connection to the new parent node while maintaining a connection to the parent node;

synchronizing data received from the parent node and the new parent node; and

terminating the connection to the parent node.

7. (Original) The method of claim 4, wherein selecting one of the candidate nodes as a new parent node for the child node comprises:

measuring distances to each of the candidate nodes;

determining a metric associated with the quality of service and each candidate node;

and

selecting one of the candidate nodes that is closest to the child node and that is operable to satisfy at least one quality of service characteristic.

8. (Currently Amended) The method of claim [[4]] 1, wherein the location information of the child node included in the request sent to the global information table to select each of the candidate parent nodes that are [[is]] physically close to the child node.

9. (Currently Amended) The method of claim [[4]] 1, comprising:

determining whether the complaint sent to the parent node of the child node timed out;

retransmitting the complaint to the parent node of the child node in response to the complaint timing out.

10. (Original) The method of claim 1, wherein detecting at a child node a degradation of quality of service comprises detecting a measured quality of service characteristic associated with the received service falling below a predetermined threshold.

11. (Original) The method of claim 1, wherein detecting at a child node a degradation of quality of service comprises detecting degradation of quality of service as perceived by a user at the child node.

12. (Original) The method of claim 1, wherein quality of service includes at least one of a metric associated with processing data at a node receiving the service and a metric associated with transmitting data for the service between nodes in the multicast tree.

13. (Canceled).

14. (Currently Amended) A method of determining location of degradation of quality of service in a multicast tree in an application layer multicast network, the method comprising:

receiving a complaint from a child node at a parent node in the multicast tree, the complaint indicating a degradation of quality of service of a service being received at the child node; and

determining whether a cause of the degradation of quality of service is located in an upstream link or is located at a child-parent link wherein the determining includes

transmitting a complaint to a parent node of the child node, the complaint indicating a degradation of quality of service at the child node,

if the parent node does not perceive the degradation of quality of service,
sending a request to a global information table for candidate parent nodes for the child node,
and the request includes location information for the child node, and

if the parent node perceives the degradation of quality of service, the parent node sends a complaint to the parent node's parent node to determine if the parent node's parent node also perceives the degradation of quality of service, and the complaint includes location information for the parent node.

15. (Canceled).

16. (Currently Amended) The method of claim 15, wherein sending a requesting ~~a list of a set of candidate nodes from a global information table~~ comprises transmitting the location information for the child node to a distributed hash table overlay network storing the global information table.

17. (Original) The method of claim 16, wherein the global information table includes at least location information and information associated with services provided by nodes in the application layer multicast network.

18. (Original) The method of claim 17, wherein the global information table is stored in a plurality of distributed hash table nodes in the distributed hash table overlay network, such that each distributed hash table node stores information for nodes physically close in an underlying physical network.

19. (Currently Amended) The method of claim 18, wherein sending a request to a requesting ~~a list of a set of candidate nodes from the~~ global information table comprises hashing a

landmark vector of the child node to identify a distributed hash table node to transmit a request for a set of the candidate parent nodes for the child node.

20. (Currently Amended) The method of claim 15, wherein the global information table stores information for nodes transmitting a complaint, the method comprising:

searching the global information table for the set of candidate parent nodes such that the set of candidate parent nodes does not include a node that transmitted a complaint.

21-26. (Canceled).

27. (Currently Amended) A parent node connected to a child node in a multicast tree, the parent node comprising:

means for receiving a complaint from the child node, the complaint indicating a degradation of quality of service of a service being received at the child node; and

means for determining whether quality of service associated with the service is degraded at the parent node;

means for transmitting a complaint to the parent node's parent node in the multicast tree indicating a degradation of quality of service at the parent node in response to determining at the parent node that the quality of service is degraded, and the complaint includes location information for the parent node; and

means for requesting a list of a set of candidate nodes from a global information table in response to determining at the parent node that the quality of service is not degraded, and the request includes location information for the child node, wherein each of the candidate

nodes is operable to provide the service to the child node and is physically close to the child node based on the location information for the child node.

28. (Currently Amended) The parent node of claim 27, further comprising:

means for hashing the location information for the child node to identify a location in a distributed hash table overlay network storing the global information table; and

means for transmitting the location information with a request for a list of a set of candidate nodes with the location information to the identified location.

29. (Original) The parent node of claim 28, wherein the global information table includes at least location information and information associated with services provided by nodes in a network including the multicast tree.

30. (Original) The parent node of claim 29, wherein the global information table is stored in a plurality of distributed hash table nodes in the distributed hash table overlay network, such that each distributed hash table node stores information for nodes physically close in the network.

31. (Currently Amended) Computer software embedded on a ~~tangible~~ computer readable ~~medium~~ storage device, the computer software comprising instructions performing:

detecting at a child node in a multicast tree a degradation of quality of service associated with a service being received at the child node;

determining whether the degradation of quality of service is resulting from a child-parent link or an upstream link to the child-parent link in the multicast tree, wherein the determining includes

transmitting a complaint to a parent node of the child node, the complaint indicating a degradation of quality of service at the child node,

if the parent node does not perceive the degradation of quality of service, a request is sent to a global information table for candidate parent nodes for the child node, and the request includes location information for the child node,

if the parent node perceives the degradation of quality of service, the parent node sends a complaint to the parent node's parent node to determine if the parent node's parent node also perceives the degradation of quality of service, and the complaint includes location information for the parent node;

selecting a new parent node for a child node incident to the upstream link in response to detecting the degradation of quality of service is resulting from the upstream link; and

selecting a new parent node for the child node from the candidate parent nodes in response to detecting the degradation of quality of service is resulting from the child-parent link.

32-33. (Canceled)

34. (Currently Amended) The computer software of claim 31 comprising instructions performing:

~~transmitting a complaint to the parent node, the complaint indicating a degradation of quality of service at the child node;~~

~~receiving a list of a set of candidate nodes in response to the degradation of quality of service resulting from the child-parent link; and~~

selecting one of the candidate nodes as a new parent node for the child node.

35-36. (Canceled).

37. (New) The method of claim 1, wherein selecting a new parent node for the child node from the candidate parent nodes further comprises, at the parent node, sending the request to a distributed hash table overlay network storing the global information table.

38. (New) The method of claim 1, further comprising:

using the location information for the parent node to identify candidate parent nodes for the parent node if the parent's node parent node also perceives the degradation of quality of service.